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ABSTRACT

Included in this training manual are descriptions and pictures of the following agricultural animal pests: mosquitoes, stable flies, horse flies and deer or yellow flies, house flies, horn flies, wound-infesting larvae, lice, mites, ticks, and bots and grubs. Information is given on the life-cycle and breeding habits of the pests. Methods of control are suggested for each type of pest. Finally, pesticide toxicity, residue potential, and hazards are discussed along with pesticide formulations, application techniques, and extent of treatment. (BB)

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AGRICULTURAL ANIMAL PEST CONTROL

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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This manual was developed in cooperation with the Georgia Department of Agriculture.

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July 15, 1975

SE 024 706

This training manual is intended to provide you with the information you will need to meet the standards of the Environmental Protection Agency for pesticide certification, and prepare you to take an examination given by the State Department of Agriculture based on this manual. It is not intended that this training will provide you with all the information you need for effective Agricultural Animal Pest Control. Additional information in the form of publications and short courses can be obtained from the Cooperative Extension Service.

Appreciation is expressed to those who reviewed this manuscript and made helpful suggestions.

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I. Agricultural Animal Types

There are many different types of livestock. Each type is grown for either the food, pleasure or companionship they provide. For example: horses are raised mainly for companionship and the pleasure they provide; dairy cattle and milk goats for milk; beef cattle, hogs and broilers for meat; hens for eggs; sheep for wool and meat, etc. Each type of agricultural animal is attacked by one or more external parasites which normally require control. When control involves the use of pesticides, caution must be exercised to prevent contaminating man, his food supply and his environment.

II. Pests of Agricultural Animals

Agricultural animals are attacked by many different external parasites. Flies, mites, lice, ticks, bots, grubs, etc., cost producers large sums of money annually. More than $500,000,000 is lost in livestock production in the United States each year. In Georgia, it is estimated that animal pests cost livestock producers over $59,000,000 yearly. They (1) predispose animals to diseases; (2) cause anemia (due to blood loss); (3) reduce weight gains; (4) reduce feed efficiency; and (5) transmit several important animal diseases (encephalitis of horses, anaplasmosis of cattle, heartworm of dogs, etc.). The following are some of the more common pests which attack agricultural animals, the damage they cause, and their habits. An understanding of the biology of the pests to be controlled is necessary for effective, economical and safe pest control.

1. Mosquitoes

These very common insects have piercing-sucking mouthparts, and females suck blood from livestock. Mosquitoes breed in water. Adults are usually more abundant in shaded areas. Most damage to animals takes place during early morning, late afternoon and night.

Most mosquitoes spend the winter in the egg stage (Figure 1). Some winter as adults, others as larvae. When the weather warms, adults become active and mating takes place. From egg laying to adult emergence requires 10 days to 3 weeks. Adults normally live 30 days.

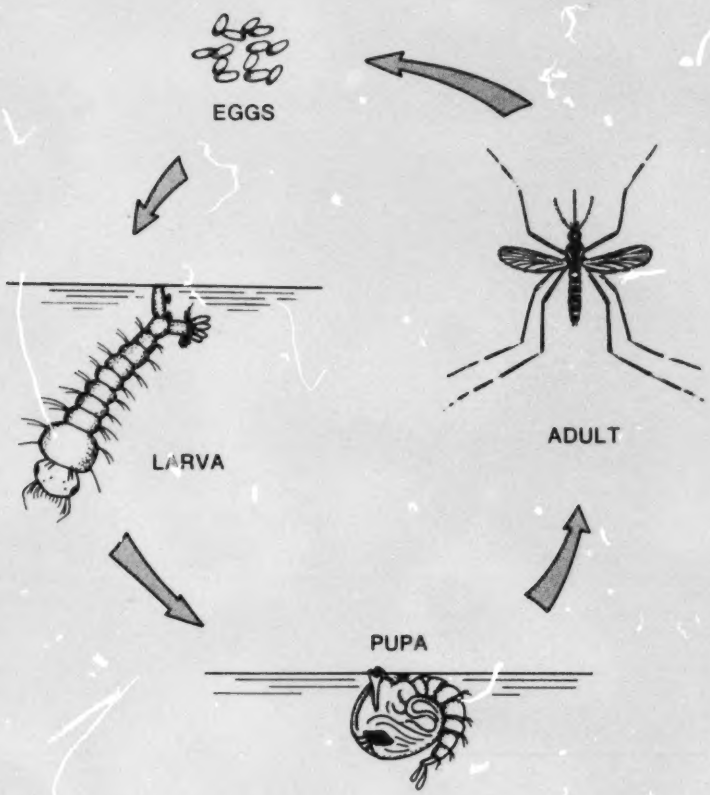


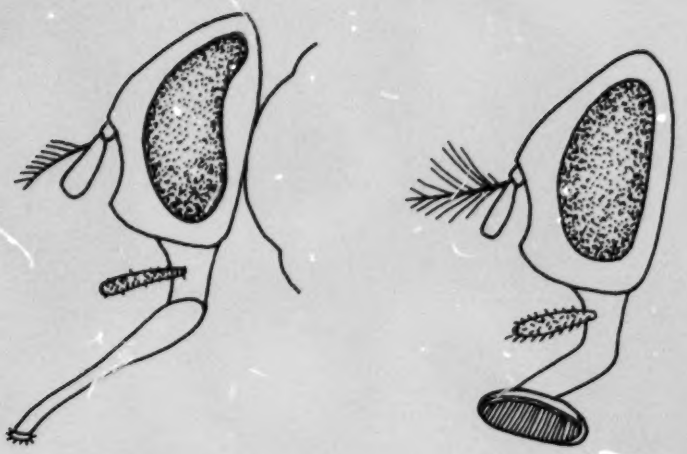
Figure 1. Mosquito Life Cycle

Most mosquitoes are difficult to control. Larvae can be destroyed by draining their breeding areas or by applying larvicides. When large bodies of water are infested or when breeding sites are numerous and widely scattered, it is probably not feasible to attempt larval control. Adult control measures usually include frequent applications of insecticides to cover all animal body parts. Frequent applications are required when short residual insecticides are applied unless the population of mosquitoes subsides. Sprays are usually most effective. Residual wall sprays can help where animals are confined in stables and barns.

2. Stable Flies

In some animal operations, especially dairies and horse stables, this is the most troublesome external parasite (Figure 2). In appearance, adults look like adult house flies, except stable flies have needle-like mouthparts that protrude from underneath the head and are used to puncture the skin and suck blood from livestock (Figure 3). Feeding takes place primarily on the legs and lower sides of animals. Flies that feed on the legs are difficult to control because the legs don't retain insecticides for long periods. They only visit animals to feed. Since they are in contact with the animal only a short time, control is difficult to obtain.

Figure 2. Adult Female Stable Fly



PIERCING MOUTHPARTS

SPONGING MOUTHPARTS

Figure 3. Piercing and Sponging Mouthparts

In most areas, stable flies overwinter as pupae in wet straw piles or strawy manure. In early spring adults emerge, mate and soon lay eggs - usually in manure mixed with straw. Extreme populations may develop in green chop, etc., causing very high populations on dairy farms. About 20 to 30 days are required for development from the egg stage to the adult.

Sanitation helps control stable flies where breeding sites are removed and destroyed. Stable flies have been shown to migrate up to 70 miles in only two days so breeding areas could be some distance from the farm. Insecticides can be applied in a number of ways but care must be taken to thoroughly cover the legs and lower sides. Residual wall sprays can kill stable flies that are resting after taking a blood meal.

3. Horse Flies (Figure 4) and Deer or Yellow Flies (Figure 5)

These pests are vicious, persistent, blood-sucking external parasites of animals. After alighting on an animal, if they are not dislodged, they cut through the skin with their knife-like mouthparts and suck blood. When they fly away, blood usually comes out of the wound. They are efficient vectors of both cattle and horse diseases.

Figure 4. Adult Black Horse Fly

Development takes place in water or soil in damp, wooded areas. Some species require more than one year to complete development. The winter is passed as larvae in soil around lakes, streams or swampy areas. Adults can fly long distances. They are most troublesome in or near wooded areas.

Fencing animals away from wooded areas and providing artificial shade can help reduce horse and deer fly attacks. Larval control is not feasible due to the large larval breeding areas involved. Insecticides that are recommended are effective in controlling horse flies but their ability to reinfest treated animals from long distances makes control difficult to obtain.

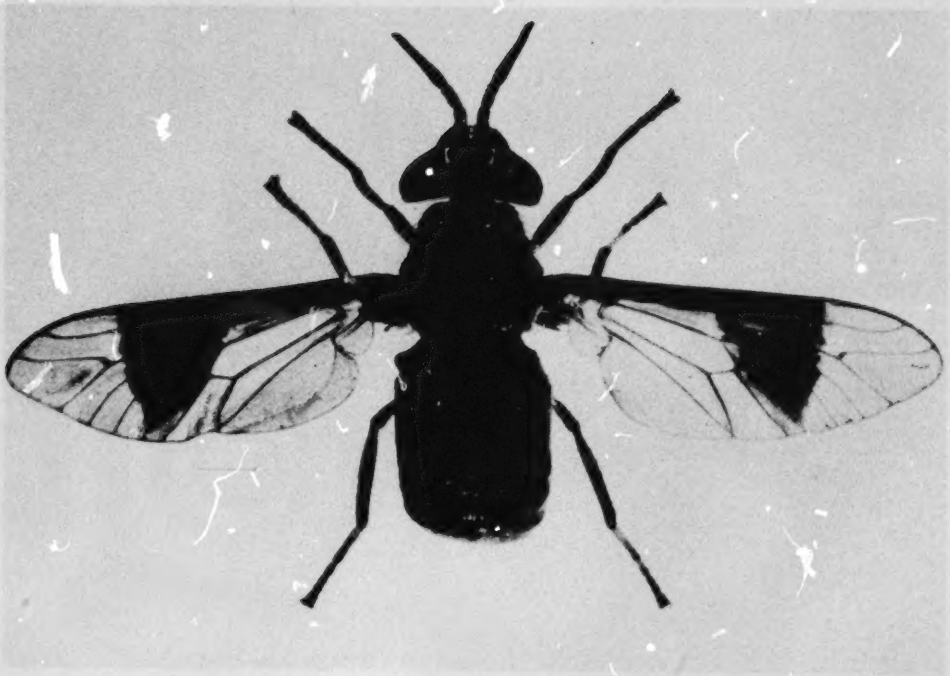


Figure 5. Adult Deer Fly

4. House Flies

House flies breed in many types of organic matter such as garbage, animal manure and accumulations of waste feed. As many as 1,000 can complete development in one pound of suitable breeding material.

House flies usually become active in early spring. Adult house flies mate and females lay eggs on decaying organic matter. Between 100 and 150 eggs are laid at a time, each female laying a total of 500 eggs during her 30-day life. In 8 to 30 hours, the eggs hatch into tiny, white, legless maggots which begin developing in the breeding material. When the maggots reach maturity - 1 to 2 weeks later - they change into the pupal or resting stage. After 3 to 10 days, the adult emerges from this pupal case. From 1 to 3 weeks are required to complete each life cycle (Figure 6) - from the egg stage

to the emergence of the adults from the pupal case.

Figure 6. House Fly Life Cycle

House flies overwinter as full-grown larvae or pupae in or beneath breeding materials. Some adults probably survive the winter in warm, protected areas in buildings. In periods of warm weather during the winter, these overwintering flies become active. If the warm weather is of sufficient duration, adult flies can emerge from protected pupal cases.

5. Horn Flies (Figure 7)

These pests are serious external parasites of beef cattle and dairy cattle. During the summer months, it is not uncommon to find 500 to 2,000 per animal hovering over their backs and crawling down among the hairs on the withers, back or belly. They suck blood and

500 can remove 1/2 pound of blood daily. They look like stable flies but are only half as large (Figure 8).

Horn flies generally overwinter as larvae or pupae in or beneath cattle droppings. When the weather warms, adults begin to appear. Adults feed on cattle, mate and lay eggs on fresh cattle droppings. Development from the egg to adult stage requires about two weeks. Adults remain on cattle most of the time. They will leave the animal to deposit eggs and some fly short distances to infest other cattle.

Figure 7. Horn Fly Adult

Figure 8. From left to right: Adult House Fly, Adult Stable Fly and Adult Horn Fly

Since adult horn flies remain on animals during most of their life, control is relatively easy to obtain using recommended insecticides. Rubbing devices are particularly effective against this pest. Larvae can be controlled by feeding animals on insecticide treated mineral, salt and ration mixtures. For effective control, animals must consume recommended amounts of the insecticide daily. This external parasite is the most prevalent and damaging pest found on beef cattle in the southeastern states yet it is the easiest to control.

6. Face Flies

Face flies (Figure 9) are common external parasites on horses,

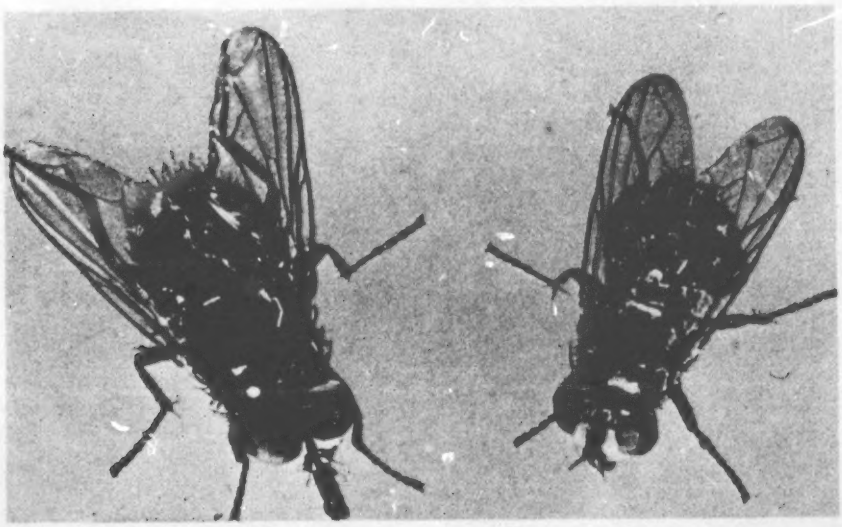


Figure 9. Adult Male and Female Face Flies

beef cattle and dairy cattle in many sections of the United States. In appearance, they closely resemble house flies. Face flies are very persistent feeders. They mostly feed around the natural openings on the animal's face. Their mouthparts are of the sucking (sponging) type (Figure 3) and cannot pierce the skin of the host. They are

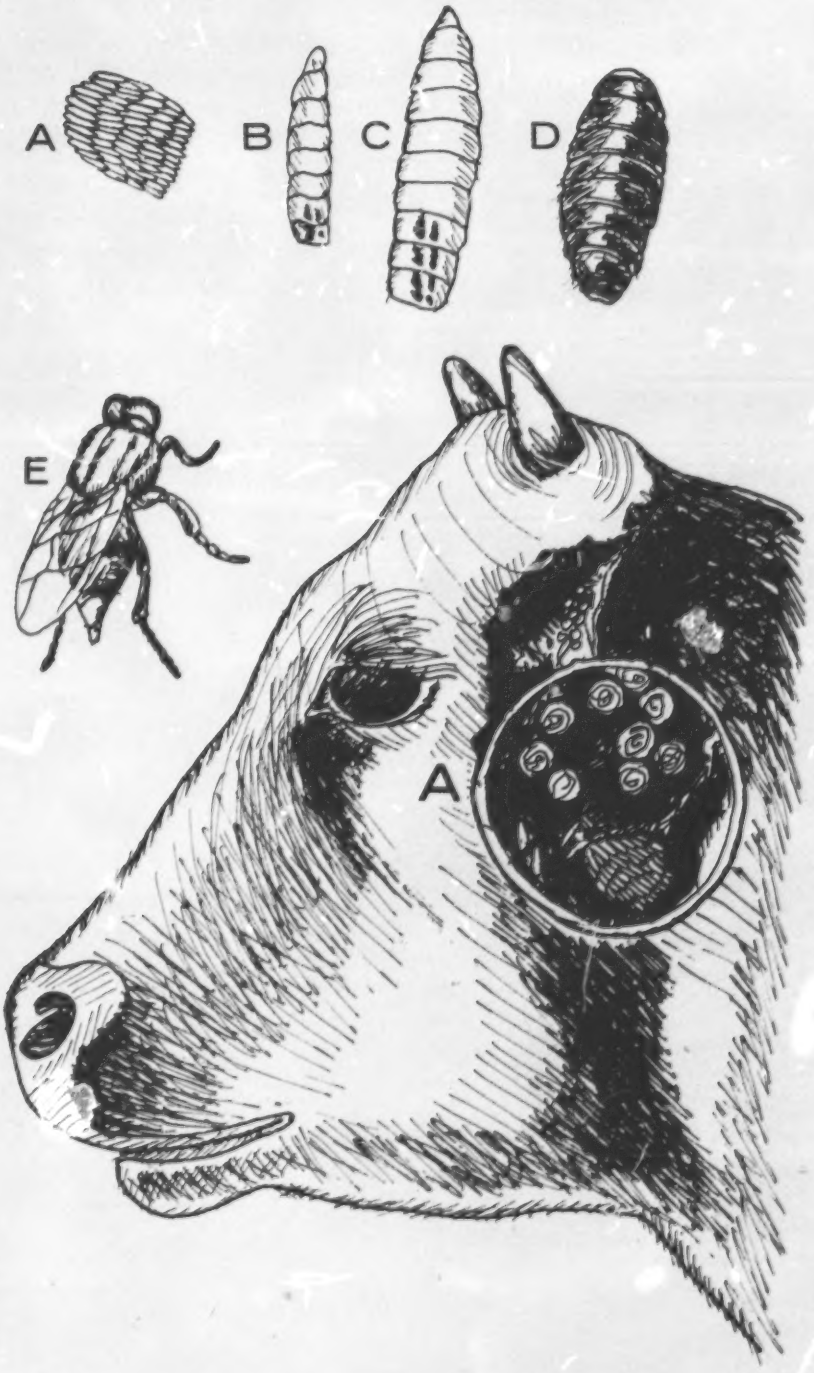
capable of transmitting the organism which causes "pink eye". Face flies probably spend the winter as adults in protected locations as in attics of homes. Adults emerge and mate when the weather warms. Female face flies lay their eggs in fresh cattle croppings. The maggots develop in the manure, pupate in the adjacent soil and emerge as adults. A female fly lays 25 to 50 eggs during her 30-day life. The total life cycle - from the egg stage to the adult stage - requires 2 to 3 weeks.

Since these pests feed mostly on the animal's face and fly long distances to reinfest treated herds, control is extremely difficult to obtain. Insecticides do not adhere readily to the animal's face and insecticides applied to the face are frequently diluted or washed away.

Frequent applications of effective insecticides to the animal's face are required. Daily forced use of rubbing devices such as dust bags offers the best means of reducing face fly populations in most situations. Sprays over the animal's body are effective for short periods only.

7. Wound-Infesting Larvae

Many species of fly larvae can attack animal wounds and cause injury and sometimes even death of animals (Figure 10). Adult flies lay eggs on wounds. The eggs soon hatch into tiny, legless maggots which then infest the wound. When the larvae reach maturity, they drop to the ground and develop into pupae. From this stage, adult flies emerge. Primary screwworm larvae are of most concern as wound-infesting larvae because they feed on living tissues. They can eventually kill an



A, Egg mass; B, Young larva; C, Mature larva; D, Pupa; E, Adult fly. A, Part of an infested wound showing egg masses, very small larvae, and the posterior ends of mature larvae.

Figure 10. Life Cycle of Wound-Infesting Fly

animal. Presently, the primary screwworm has been eradicated from the southeastern United States. Other fly larvae also infest wounds but they feed mostly on dead tissues. Constant checks of wounds are necessary to reduce damage by wound-infesting larvae.

If open wounds are found infested with larvae, they should be submitted for identification. Treat the wound and surrounding area with insecticides. These can be applied as dusts, aerosol sprays or wetting sprays. Repeat applications if necessary.

8. Lice

Lice which attack animals are of two types - blood-sucking and chewing (Figure 11). Blood-sucking lice are more prevalent on beef

Figure 11. Adult Chewing Louse on Left
and Adult Sucking Louse on Right.

cattle, dairy cattle, hogs and horses and cause damage by irritating animals when they pierce the skin with their piercing-sucking mouthparts and by removing blood, causing the animals to be unthrifty. Heavy populations of blood-sucking lice can cause severe anemia in the host animal. Chewing lice are more prevalent on poultry. They have chewing mouthparts and cause a scab-like injury.

Lice are most abundant during the cold months when the hair coat becomes thick and long and the skin is relatively dry of oil. During these months, all growth stages of lice are on the animal.

Eggs are attached to hairs (Figure 12). Hatching occurs in a few days. The young louse feeds, molts and reaches maturity in about

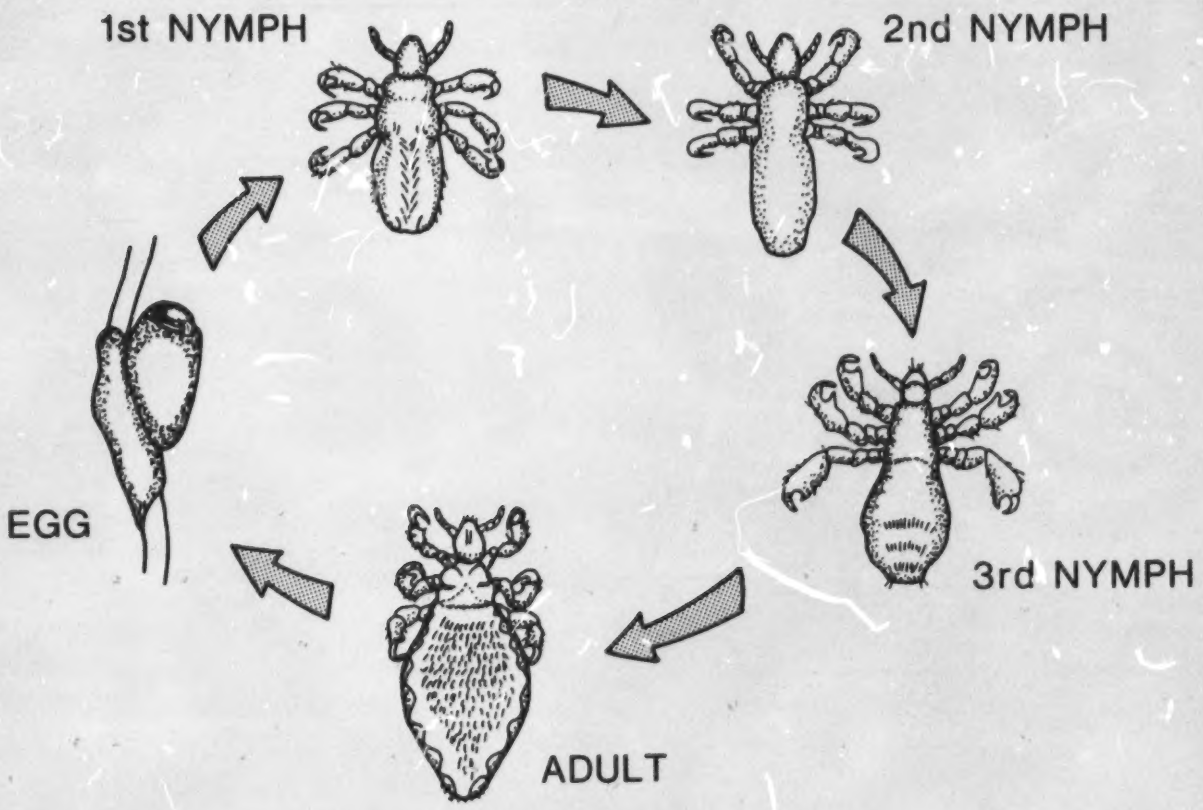


Figure 12. Life Cycle of a Louse

three weeks. Each female produces approximately 20 eggs, thus heavy populations can build up rapidly. When the hair coat is shed on animals in the spring, lice seem to disappear and don't build up again until cold weather approaches.

Since most insecticides that are applied for lice control are poor ovicides, two applications may be needed 14 days apart for more

thorough control. Some residual materials may remain for sufficient periods to control newly hatched lice. Penetration of the animal's coat of hair is essential. Pour-on applications of systemic insecticides are helpful when treating animals in cold weather.

9. Mites

Many species of mites attack animals (Figure 13). Every type of livestock has at least one species of mite which depends upon it for existence. Most mites are extremely tiny. Some are invisible to the naked eye. Skin scrapings are usually needed for positive identification.

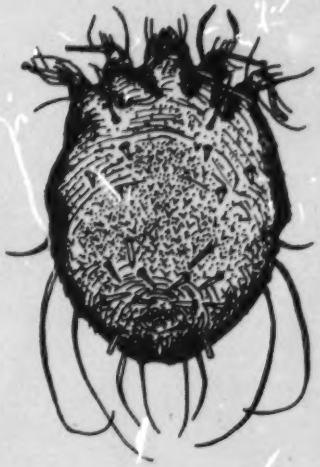


Figure 13. Mange Mite Adult

Some mites cause damage by burrowing into the animal's skin, sucking blood and discharging an irritating fluid while they feed. Bacteria may invade their burrows causing further damage. Other mites remain on the surface of the skin and suck blood with their piercing-sucking mouthparts. Mites have four pairs of legs as adults but only three pairs in the immature (larval) stage. Immatures emerge from eggs laid by adult females. Completion of a life cycle for many mite species requires less than four weeks.

Infested animals should be isolated. Since mites cause severe skin problems, these should be treated along with mites. Nearly every infestation requires at least two treatments spaced two weeks apart for effective control. Severe cases may not respond to treatment. These animals should be destroyed.

10. Ticks

Several species of ticks parasitize agricultural animals. They are usually more abundant in wooded areas and along animal paths. Most mature ticks are fairly large, about one-fourth to one-half inch long when mature, flattened, leathery, eight-legged blood-sucking external parasites.

Both males and females suck blood. After feeding, engorged females deposit thousands of eggs on the ground (Figure 14). The eggs hatch in about two weeks and the six-legged larvae or "seed"

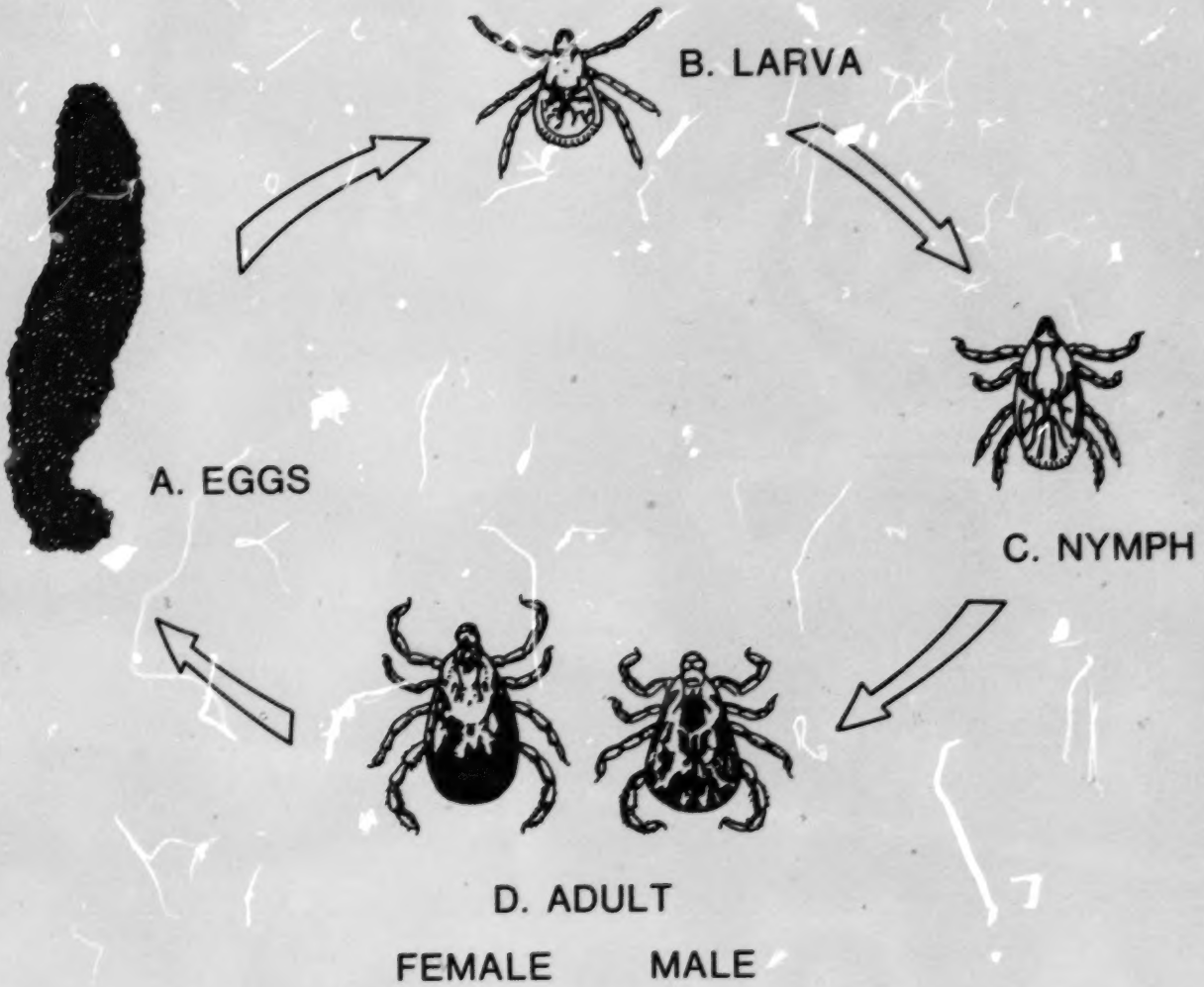


Figure 14. Stages in Life Cycle of a Tick

ticks find a host and attach themselves. After about five days feeding, they drop off, shed their skin and become eight-legged nymphs. The nymphs feed, molt, and go through two or three stages to become adults. The entire life cycle requires a minimum of 30-40 days if food and temperature are suitable but frequently the interval is much longer - as much as a year may be needed.

Control can be obtained by thoroughly covering animals with spray or dip applications of insecticides. Penetration of the hair coat is essential. Removal of heavy vegetation and fencing cattle away from wooded areas will help prevent infestations.

11. Bots and Grubs

Adult grubs and bots resemble bees. Adult heel flies usually attach eggs to hairs on the animal's body, especially those of the legs and belly (Figure 15). Sheep and horse bot fly females deposit eggs in the nostrils and on the lips and legs of animals. Tiny larvae hatch from the eggs, burrow through the host's skin and begin migrating through the tissues of the host. Some attach to linings of the digestive tract. All eventually leave the animal to pupate in the soil. Adults emerge from the pupal case, mate and females lay eggs. Normally, there is one generation each year.

Treatment is normally applied in the form of systemics. These should be administered as sprays, dips, pour-ons and spot-ons as soon as adult heel fly season is completed and at least six weeks before the grubs are expected in the animal's back in the case of cattle grubs.

If beef cattle are treated for grubs when large numbers of larvae are present in tissues around the gullet and spinal column, these animals can show toxic side effects. This can be prevented by not treating cattle

A, Eggs attached to hair; B, Small larvae, ; C, Encysted larva and the hole in the hide; D, Puparium under litter; E, Adult heel fly

Figure 15. Life Cycle of a Grub

from areas outside the southeastern United States during October through February. Animals from other areas can be treated anytime during the year except when label directions disallow treatment.

III. Pesticides for Agricultural Animal Pest Control

1. Pesticide Toxicity

Pests of agricultural animals can weaken animals, thereby causing them to be unthrifty, predispose them to diseases and can even cause their death. Pesticides will protect animals from pests; however, all pesticides are poisons and can be toxic to warm-blooded as well as cold-blooded animals. For this reason, recommended pesticides must be applied properly to prevent injury to animals.

Individual animals can show toxicity to certain pesticides and materials contained in pesticide formulations. Applicators should always be aware of this. Sensitive animals should not be treated or should be treated only with pesticide formulations non-toxic to the animal. Brahman beef cattle can show sensitivity to some organic phosphate insecticides. For this reason, organic phosphate pesticides should not be applied to these animals if so indicated on the pesticide label. Poisoning is usually exhibited as excessive salivation, eye watering, defecation, urination and muscle twitching.

Animals which are under stress or which will be put under stress should not be treated.

Pesticides should not be applied in combination with other pesticides unless so stated on the label.

The skin of some horses is extremely sensitive to various pesticide formulations. Before treating horses with pesticides, it is recommended

that a small patch of skin on each animal be treated with the pesticide formulation approximately 24 hours before the entire animal is treated.

2. Residue Potential

Most agricultural animals are raised for the human food products they produce. For this reason, it is extremely important that pesticide residues not be allowed to accumulate in illegal amounts in edible tissues. Producers should apply only approved insecticides to animals which are being finished for slaughter or are producing edible products such as milk. Some insecticides are eliminated slowly from animal tissues. Others are quickly eliminated. For this reason, intervals between application and slaughter or use of eggs and milk as human food should be strictly adhered to. For these reasons, label directions should be followed to the letter. Failure to do this can result in animals being confiscated and responsible individuals prosecuted.

3. Pesticide Hazards

a. Pesticide Formulations

The pesticide formulation to be used must be taken into consideration when treating agricultural animals. Sprays are generally suited for treating most animals, except, when temperatures are below freezing it is not advisable to spray or dip livestock. This can predispose them to diseases such as pneumonia. Insecticides applied during very hot, still days may cause damage to treated animals. When applying ready-to-use oil sprays, be careful not to allow the oil to penetrate the animal's hair so it comes in contact with the skin. Some types of agricultural animals show toxic effects when oils are applied to their skin.

Individual animals can show allergic responses to certain pesticide formulations. Applicators should be aware of this and be prepared to apply remedial measures such as removing the insecticide from the affected animal. Sensitive animals should not be retreated unless a suitable pesticide formulation can be used. Pour-on and dust pesticide formulations are recommended when treating animals in freezing temperatures because they do not add excessive amounts of moisture to the animal.

b. Pesticide Application Techniques

When treating agricultural animals for external parasite control, it is important that insecticides be placed so that contact with the external parasites will occur. The selection of an insecticide delivery system will depend upon the animal to be treated and the pest to be controlled. For example, when treating animals for lice, mite and tick control, penetration is normally very important. Use 100-200 pounds of pressure when applying pesticides for control of these pests. Pesticides kill only the mites and lice, not the eggs, so retreatment is normally needed to control newly hatched pests.

Grub spray treatments should be applied in such a manner that the skin, not just the hair of the animal becomes thoroughly wet. Spray pressures of 200-400 pounds per square inch are recommended depending on the thickness of the animal's coat of hair. Apply treatments after egg laying has been completed.

Power sprayers, knap-sack sprayers, compressed air sprayers and rubbing devices such as back rubbers and face rubbers are satisfactory for applying liquid insecticides to agricultural animals. Rubbing devices usually consist of a pesticide reservoir and a material on

which animals rub that acts as a wick to pull the insecticide from the reservoir, thereby keeping the rubber saturated with insecticide. Homemade rubbing devices (Figure 16) normally consist of burlap bags

Figure 16. Homemade Backrubber

rolled around chains or wire. The insecticide is poured on the burlap bag to keep it charged. Automatic sprayers are commonly used to apply insecticides to animals on a frequent basis. They are commonly used to treat dairy animals as they exit milking parlors.

Dusts may also be used for control of some external parasites on agricultural animals. They may be applied by hand or in suspended, self-treatment dust bags (Figure 17).

Figure 17. Homemade Dusting Station

Systemic insecticides are those insecticides which are picked up by the animal's blood system and transported throughout the animal's body. They can be applied as pour-ons, spot-ons, sprays, feed additives and in dipping vats. Some systemic insecticides are very effective against grubs, horn flies and lice.

c. Age and Size of Animals

Even when animals are healthy, their age and size are important considerations when applying pesticides. Many insecticides are applied according to the size of the animal with less being applied to small animals and more to large animals. Many applications are applied to

point of run off. Generally, this is the amount of insecticide recommended for use on animals. Systemic insecticides and ready-to-use oil sprays must be applied in exact amounts for adequate control of pests and prevention of injury to animals.

Young animals, especially those under six months of age, should not be treated when information on the pesticide label specifically prevents application to younger animals.

d. Extent of Treatment

Many pests on agricultural animals can be controlled with very small quantities of pesticides when applied to specific areas on the infested animal. For example, when treating infested wounds on animals, only treat the wound and immediate surrounding area.

When treating livestock for fly control, it is usually more efficient to treat animals daily with small quantities of pesticides. If rubbing devices such as back rubbers and dust bags are placed where animals cannot avoid them, they will treat themselves daily with small amounts of insecticides, thus obtaining good pest control with less material. The application technique which will afford adequate control with the least excitement of treated animals and least contamination of the environment should be utilized for the most effective, economical and safe control of agricultural animal parasites.

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